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UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF MICHIGAN
SOUTHERN DIVISION

FILED

MAY 13 2004
CLERK'S OFFICE
U. S. DISTRICT COURT
EASTERN MICHIGAN

CHRIMAR SYSTEMS, INC.,

Plaintiff,

v.

Case No. 01-71113

CISCO SYSTEMS, INC.,

HONORABLE AVERN COHN

Defendant.

_______________________________/

MEMORANDUM AND ORDER
GRANTING DEFENDANT'S MOTION FOR SUMMARY JUDGMENT OF INVALIDITY, GRANTING DEFENDANT'S MOTION FOR SUMMARY JUDGMENT OF NONINFRINGEMENT, AND DENYING PLAINTIFF'S MOTION FOR SUMMARY JUDGMENT OF INFRINGEMENT

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I. Introduction

This is a patent case. Plaintiff ChriMar Systems, Inc. (Chrimar), holder of U.S. Patent Number 5,406,260 (the '260 patent) covering a Network Security System for Detecting Removal of Electronic Equipment, is suing Cisco Systems, Inc. (Cisco) for infringement in the making, etc., of devices which fall within the scope of one or more claims of the '260 patent. Chrimar claims infringement of claims 1 to 6, 8 to 12, and 14 to 19 of the '260 patent. At this time the sole claim in issue is representative claim 1; the remaining claims have been bifurcated and proceedings stayed.[1] The Court previously conducted a Markman proceeding to construe six of the limitations of claim 1.

Before the Court are three motions: (1) Cisco's motion for summary judgment of invalidity of claim 1, (2) Chrimar's motion for summary judgment of infringement, and (3) Cisco's motion for summary judgment of noninfringement. The motions were referred to a Special Master, who issued a report recommending that the Court grant both of Cisco's motions and deny Chrimar's motion.

For the reasons that follow, Cisco's motions are GRANTED and Chrimar's motion is DENIED. This case is DISMISSED as to claim 1. Further proceedings are required relating to the remaining bifurcated claims.

[1]See Amended Order of Bifurcation (July 25, 2002).

II. Background

A. The '260 Patent

1. Generally

The ABSTRACT of the '260 patent describes the invention:

A system and method are provided for monitoring the connection of electronic equipment, such as remote computer workstations, to a network via a communication link and detecting the disconnection of such equipment from the network. The system includes current loops internally coupled to protected pieces of equipment so that each piece of associated equipment has an associated current loop. A low current power signal is provided to each of the current loops. A sensor monitors the current flow through each current loop to detect removal of the equipment from the network. Removal of a piece of hardware breaks the current flow through the associated current loop which in turn may activate an alarm. This invention is particularly adapted to be used with an existing 10BaseT communication link or equivalent thereof, employing existing wiring to form the current loops.

Figure 1 illustrates the invention generally:

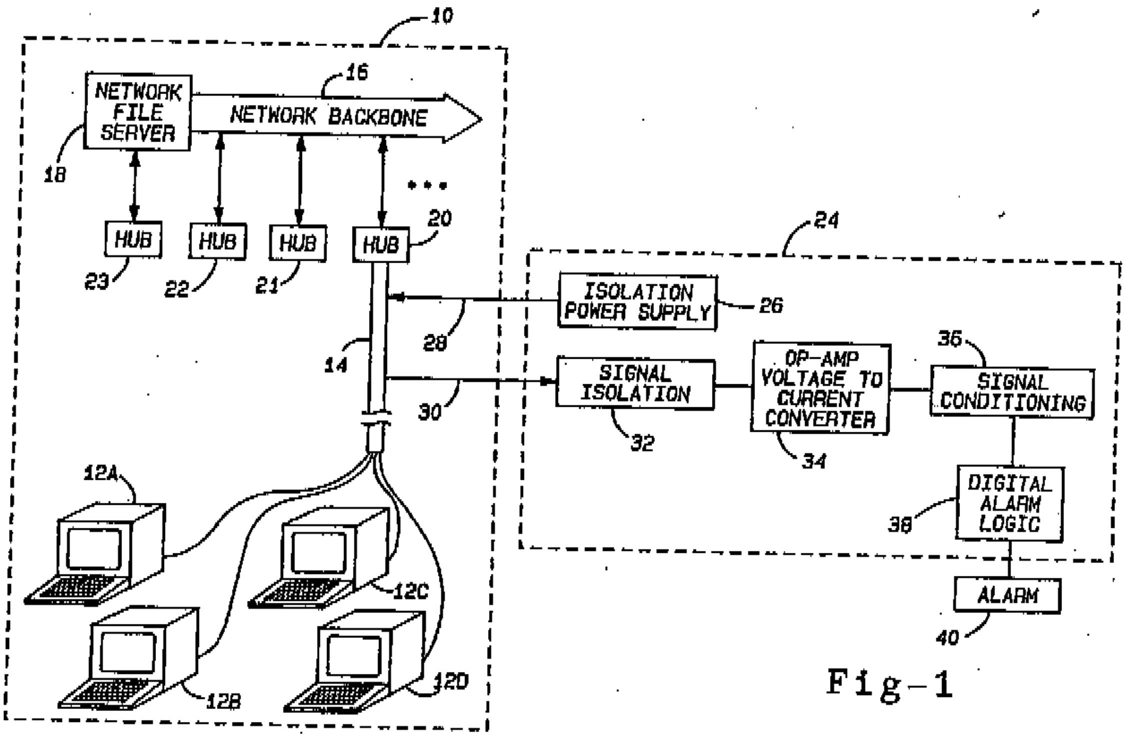


Fig-1

The BACKGROUND OF THE INVENTION describes the problem solved by the invention and the advance in the art as follows:

> Today, computer network systems are frequently employed to provide efficient computing capabilities throughout a large work area. Existing computer network systems generally include a number of remotely located work stations coupled via a data communication link to a central processing center. For instance, many educational institutions such as universities commonly provide a large number of individual work stations at different locations throughout the university campus so as to allow easy computing access to the computer network system. However, the wide dissemination of such equipment at remote locations has made the equipment an accessible target for computer thieves.
>
> Accordingly, a number of methods have been developed for guarding against the unauthorized removal of electronic equipment. . . .
>
> More recent methods of theft protection have included the sensing of a current loop coupled to the protected equipment. One such method is discussed in U.S. Pat. No. 4,654,640 issued to Carll et al which discloses a theft alarm system for use with a digital signal PBX telephone system. This method includes a plurality of electronic tethers which are connected to individual pieces of protected equipment by way of connectors which in turn are bonded to the surface of the protected equipment. Each tether includes a pair of conductors which are connected together to form a closed current loop via a series resistor and conductive foil which is adhesively bonded to the outside of the equipment. However, this method requires the addition of an externally mounted current loop, and it is conceivable that the current loop may be carefully removed without any detection.
>
> It is therefore desirable to provide for an enhanced network security system which detects unauthorized removal of remotely located pieces of hardware from a network. More particularly, it is desirable to provide for such a security system which feasibly employs separate current loops provided through an existing data communication link to monitor the presence of remotely located computer equipment. In addition, it is desirable to provide for a security network system which may be easily and inexpensively implemented in an existing network system and may not be easily physically removed or detached from tile system without detection.

Claim 1 of the '260 patent (broken down into appropriate clauses) reads:

1. A security system for detecting disconnection of electronic equipment from a network, said security system comprising:

current loop means including separate current loops associated with different pieces of monitored equipment,

each of said current loops employing a pair of data communication lines which connect one of the associated pieces of equipment to the network and which are coupled to existing internal circuitry within the associated piece of monitored equipment,

and wherein respective pairs of data communication lines are associated with different ones of the associated pieces of equipment;

source means for supplying a low DC current signal to each of said current loops; and

detector means for monitoring the current signal through each of said current loops and detecting a change in said current signal through one of said current loops which represents disconnection of said associated piece of equipment from the network.

2. Preferred Embodiment

A brief description of the operation of the preferred embodiment of the '260 patent in Figure 2 is necessary before addressing the issues of validity and infringement:

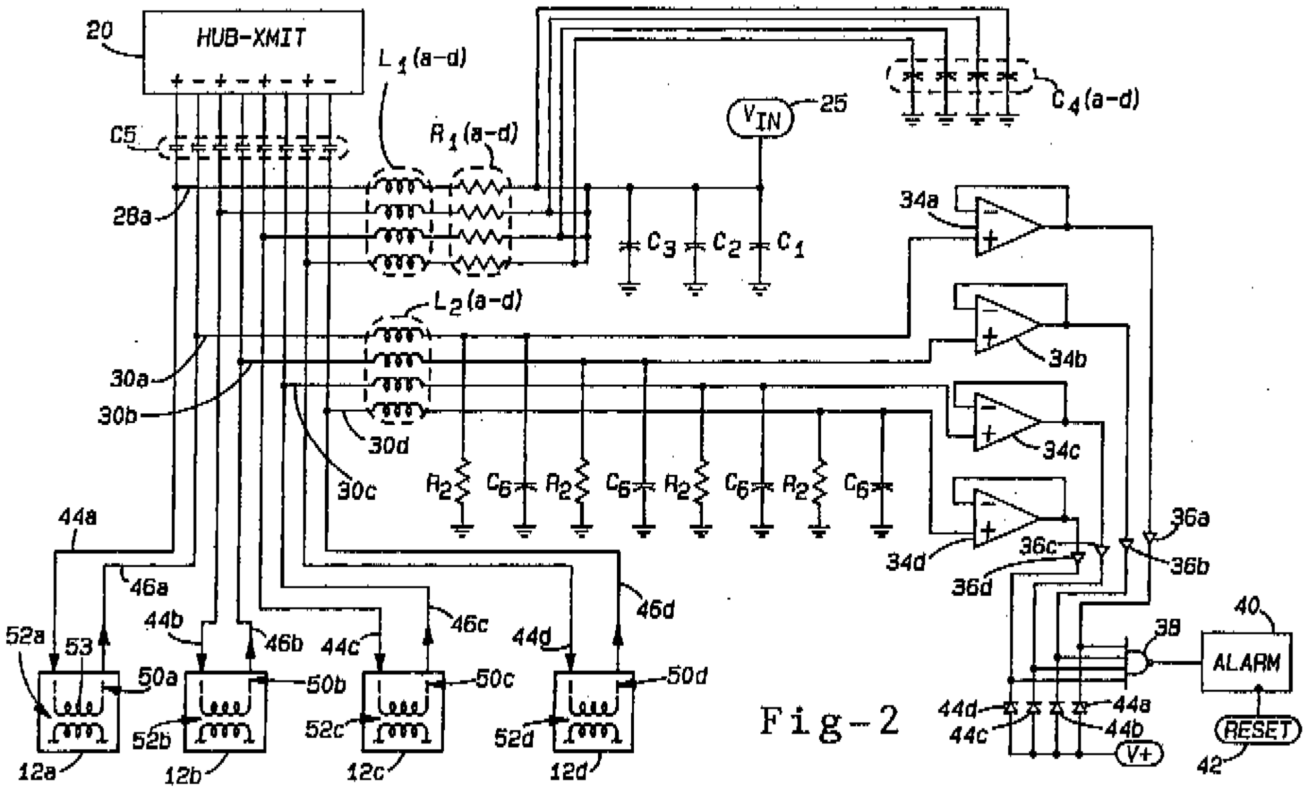


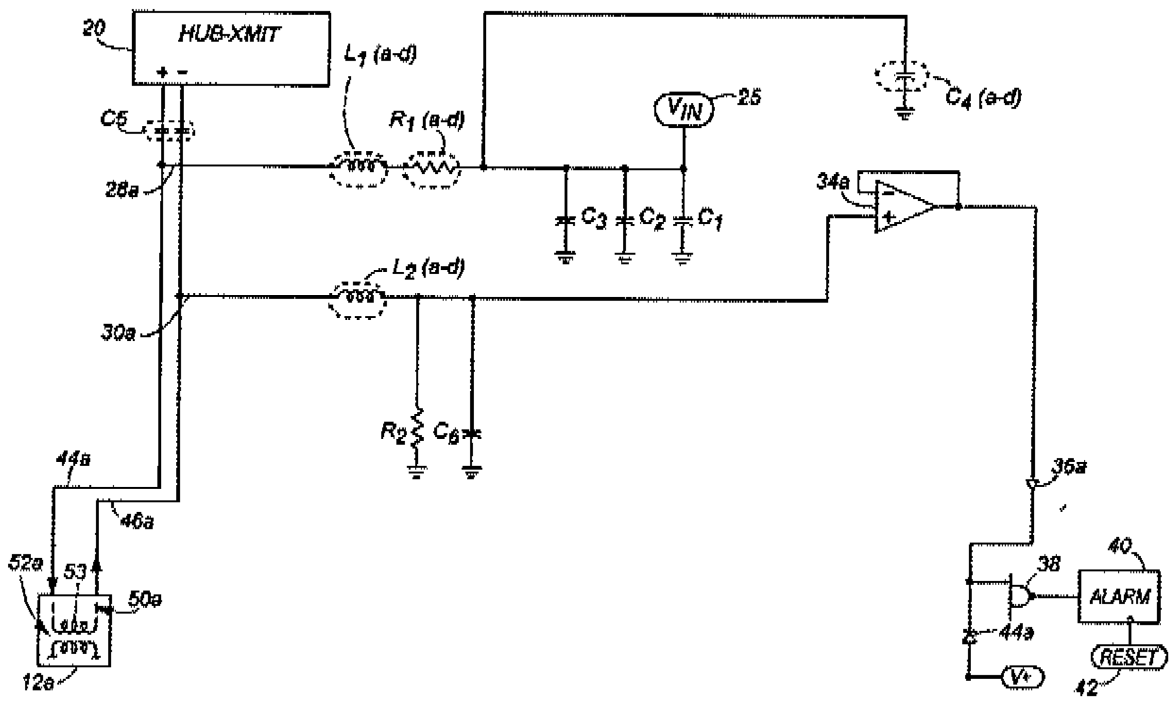
Fig-2

a. General Operation

The '260 patent generally provides for a network security system for detecting the unauthorized removal of remotely located electronic equipment. For example, multiple personal computers can be connected to a hub through communication lines that transmit and receive data. The hub is in turn connected to a network file server or network backbone such as Ethernet. The security system is preferably installed between the hub and the personal computers, as shown in Figures 1 and 3. The '260 patent takes advantage of existing communication lines between the hub and computers by injecting a low direct current (DC) signal, which does not interfere with normal data communication, and detecting disconnection of a computer when the

current signal is not looped back from the computer. There are four remotely located personal computers and four associated current loops in Figure 2.

The following is a modified version of Figure 2 displaying the circuit path for one of the computers in isolation:



The hub 20 communicates with remotely located personal computer 12a through transmit wires 44a and 46a. The transmit wires are connected to an isolation transformer 52a in the personal computer to form a current loop 50a. An isolation power supply 26 (shown in Figure 1; not shown in Figure 2) inserts a continuous low DC current signal into each current loop. Accordingly, a low voltage of approximately 5 V is received at input terminal 25.

Following the current path from V_{IN} (the input terminal 25), capacitors C_1, C_2, C_3, and C_4(a) filter out undesirable AC signals. Resistor R_1(a) ensures a low current flow across the power supply line 28a and inductor L_1(a) blocks unwanted AC signals. The low DC current signal flows from line 28a through transmit wire 44a to the personal computer and is so small that it does not interfere with other signals going to and from the computer. The current signal reaches transmit wire 46a at the other end of the loop and is picked up by receive power line 30a.

The current signal next flows to a signal isolation device 32 (shown in Figure 1; not shown in Figure 2), which is comprised of an RLC circuit of inductor L_2(a), resistor R_2 connected to ground, and capacitor C_6. Capacitor C_6 is not necessary to the circuit but functions to stabilize the voltage drop across resistor R_2. An op-amp voltage-to-current converter 34a is then used to isolate one side of the circuit from the other side. It achieves this by replicating the voltage at its input as an output. However, no current from the current loop goes into the input of op-amp 34a because all of the current goes through resistor R_2. The op-amp 34a has a separate power supply that is not shown in Figure 2. The separate current applied to op-amp 34a is necessary to drive the input to the Schmitt trigger 36a. The Schmitt trigger 36a is a threshold detector that produces a set output when the input exceeds a threshold amount. For instance, if the input voltage is above the threshold, the Schmitt trigger 36a outputs after a short delay a "high" signal of 5 V. If the voltage is below the threshold, it outputs a "low" signal of 0 V. The "high" or "low" signal drives both a NAND gate 38 and a light emitting diode (LED) 44a.

b. Operation When Equipment Is Connected

When the personal computer 12a is physically connected to the network, the low DC current signal flows from V_{IN} through the current loop and then through resistor R_2 to ground. If $R_1(a)$ is one kiloohm and R_2 is 100 kiloohms, the voltage at the node above resistor R_2 is 4.95 V. Because no current from the loop flows into the op-amp 34a, the voltage at the input terminal of op-amp 34a, which is replicated at the output, is 4.95 V. The output current at the output of op-amp 34a depends on the amount of separate power supplied to the op-amp 34a. The output voltage of 4.95 V is received at Schmitt trigger 36a, which forces a "high" signal of 5 V at its output. When all of the computers are connected, they will each produce a "high" signal indicating a continuous current loop. Consequently, the NAND gate produces a "low" output signal for the alarm. Also, the LED 44a will be "off" because there is no voltage difference between the "high" voltage and V+.

c. Operation When Equipment Is Disconnected

When the personal computer 12a is disconnected from the network, the current loop is broken so no DC current signal will flow to receive power line 30a. Hence, the voltage drop created by resistor R_2 transitions to zero. There is still no current flow into the op-amp 34a and the zero voltage at the op-amp 34a's input is replicated at the output. The Schmitt trigger 36a then forces a "low" signal of 0 V for the NAND gate. Because one of the NAND inputs is "low," the NAND gate produces a "high" signal that turns on the alarm. Also, the LED 44a turns "on" and lights up, indicating that personal computer 12a has been disconnected. This is because there is now a voltage

difference between the "low" voltage and V+.

3. The Markman Proceeding

The Court held a Markman hearing on May 16, 2002. The Memorandum and Order on Claim Construction which followed interpreted six of the limitations of claim 1.[2] The Court also identified the proper structure for two means-plus-function limitations under 35 U.S.C. § 112, ¶ 6.[3]

Claim Language	**Interpretation**	**Corresponding Structure**
a security system	Not a limitation.	
current loop means	Multiple current loops with each loop associated with a corresponding piece of electrical equipment. Each of the current loops is a pair of data communication lines that connect the corresponding piece of electronic equipment to a network through existing internal circuitry.	
existing internal circuitry	Electronic circuitry is circuitry present in the monitored piece of electronic equipment at the time the end user acquires it.	
source means	A DC power source is a source that is capable of generating low DC current in the multiple current loops.	input terminal 25 and isolation power supply 26
low DC current signal	A DC current that is sufficiently low so that it does not interfere with or adversely affect the operation of the associated electronic equipment or computer network.	

[2] See Memorandum and Order on Claim Construction (August 8, 2002).

[3] See Order on Corresponding Structure (August 27, 2002).

detector means	One or more electronic components capable of providing an indication of a change in current flow which represents disconnection of a piece of electronic equipment from the network. The indication need not be human-perceptible.	resistor R_2

B. The Cisco Devices

Chrimar says that three types of computer networking products made and sold by Cisco infringe claim 1 of the '260 patent: IP Phones, Inline Power Switches, and Power Patch Panels.[4]

1. IP Phones

Cisco's IP Phone is a digital telephone that communicates over a computer network rather than conventional telephone lines.[5] It is connected to the network in the same manner as ordinary workstations and works by converting voice signals into digital signals for transmission over a computer network. The combination of voice, data, and video capabilities over one physical network infrastructure is called "multiservice networking."

Just as an ordinary telephone can draw power from the telephone line, the IP Phone can obtain power from the cables connecting it to the network, such as category 5 unshielded twisted pair (UTP) cable. Cisco refers to this as "inline power" and markets a number of products based on the feature.

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[4]Chrimar cites numerous model numbers for each of the allegedly infringing products. The Court will refer to each type of device collectively because the parties agree that each model possesses the same basic structure.

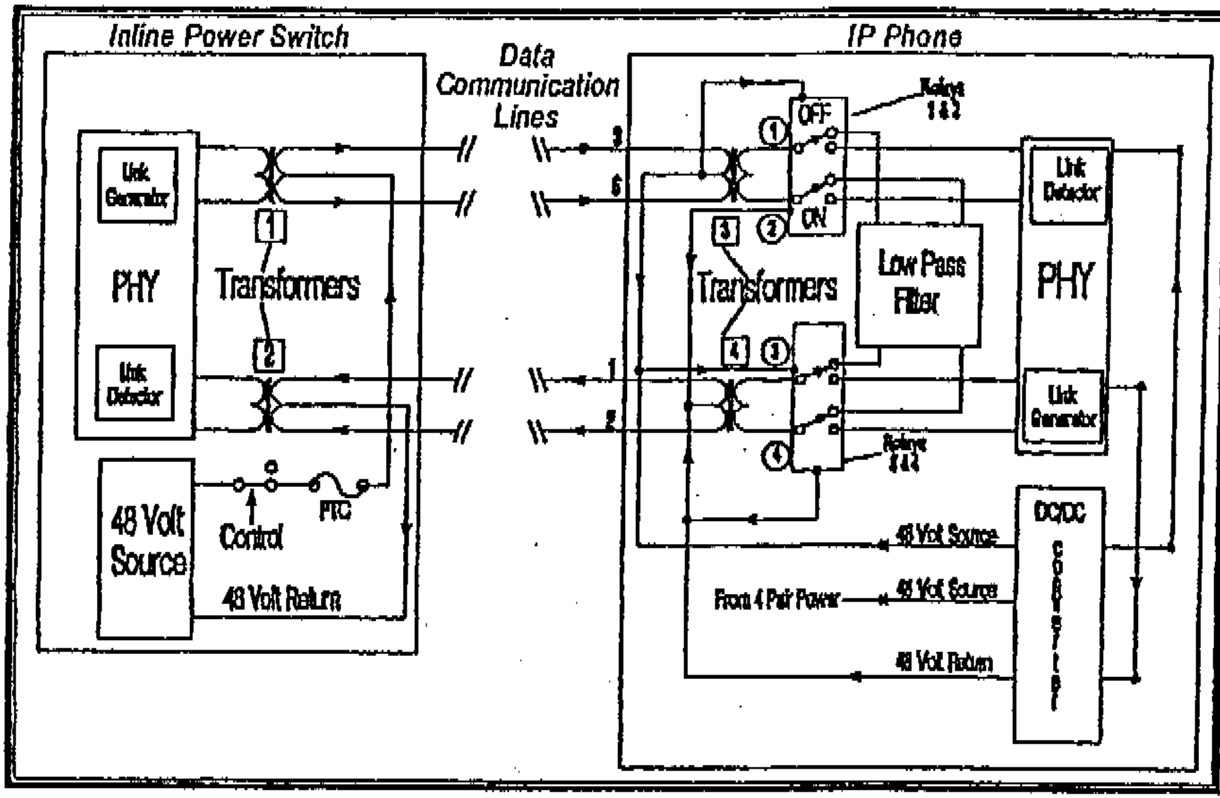
[5]Chrimar also says that Cisco's "Aironet" wireless access point infringes claim 1. The operation of the wireless access point is similar to that of the IP Phones.

2. Inline Power Switch

A "switch" is an electronic device that filters and forwards data communications between different points on a network, ensuring that the various pieces of data traveling across the network reach their respective destinations. Cisco's Inline Power Switch performs this function but is also able to supply inline power to devices on the network that require it, such as IP Phones. One advantage of this technology is that when the Inline Power Switch is connected to an uninterruptable power supply (UPS), network devices can still be used even when the power in the building goes out.

The Inline Power Switch provides 100-180 milliamps of current to the IP Phone, which is specifically designed to handle this amount of current. Most network devices, however, are not able to handle such a large current and would be damaged if connected to the same port as an IP Phone. Consequently, there must be some way for the Inline Power Switch to recognize what type of device is connected to a particular port. If it is an IP Phone, power should be supplied. If a non-inline power device is plugged into the network, though, power should not be supplied. To accomplish this, Cisco uses a "phone discovery algorithm." The operation of this feature is illustrated in the following physical layer diagram:[6]

[6]Although Cisco disputes some aspects of the diagram, it is instructive for explaining the operation of the Inline Power Switch and IP Phone generally.



Generally, phone discovery is achieved by sending an AC test signal to every device attached to the network and listening for a specific "echo" that is sent back only by IP Phones, which contain specialized circuitry. When the Inline Power Switch receives the signal back, it recognizes the device as an IP Phone and begins to supply power.

More specifically, the Inline Power Switch in the above diagram is connected to the IP Phone by a transmit pair (wires 3 and 6) and a receive pair (wires 1 and 2).[7] Center-tapped transformers 1, 2, 3, and 4 are used at each end creating a typical

[7]There are eight wires (four twisted pairs) in a category 5 data communication cable. Wires 1, 2, 3, and 6 are used to send and receive data communication signals, while wires 4, 5, 7, and 8 are "spare" wires.

phantom current loop.[8] The Inline Power Switch includes a 48 volt DC power source for supplying current to the loop, which is connected to a control switch and PTC (positive temperature coefficient) thermistor.[9] Initially, the control switch is open so power is not being supplied.

An IP Phone is then connected to the network. The Link Generator in the Inline Power Switch sends out a "special discovery pulse"[10] over wires 3 and 6. The IP Phone has a set of relays (two-state switches), which are initially in the "off" position. The special discovery pulse shunts to a low pass filter that blocks other signals and then

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[8]According to Cisco's expert, Rich Seifert, there are two different methods of injecting DC currents into communications lines. A "differential current loop" superimposes the DC current onto a normal data communications signal in a single wire pair. Thus, the DC current flows in opposite directions on each wire in the pair and may interfere with the data communications signal. A "phantom current loop," by contrast, uses two wire pairs with center-tapped transformers. Current flows in the same direction on both wires of the pair so the DC current does not ordinarily interfere with the data communications signal. Because of this arrangement, the injected DC current can be much greater for a phantom current loop than a differential current loop. Figure 2 in the '260 patent shows a differential current loop.

[9]According to Cisco's expert, Karl Nakamura, the PTC thermistor "is basically a circuit breaker or fuse designed to cut off power in the event of a short circuit or any other fault that causes an over-current condition." The resistance of the PTC thermistor is temperature-dependent. The PTC thermistor has low resistance under normal current conditions. When the PTC thermistor receives excessive current, its resistance increases to block most of the current.

[10]In a typical network that follows the IEEE 802.3 international standard for Ethernet, a switch detects the presence of a device on the network (in the absence of data communications) by continuously sending out standard AC "link integrity pulses" (or "idle" character pulses in 100BASE-TX communication), which a connected device continuously sends back. The Inline Power Switch sends out the special discovery pulse to look for inline power devices and sends out link integrity pulses to look for non-inline power devices.

travels back to the Inline Power Switch over wires 1 and 2.[11] The Link Detector in the Inline Power Switch recognizes the presence of an IP Phone and closes the control switch to begin supplying inline power. DC current reaches the IP Phone causing the coils in the relays to go to the "on" position. The IP Phone is now powered and data communication can begin. Data pulses are interpreted by the Inline Power Switch as a command to keep supplying inline power. Also, during normal data communications, the Inline Power Switch sends out normal link integrity pulses to verify that the device is still connected. The IP Phone receives these pulses and forwards them back to the Inline Power Switch to tell it to keep supplying power.

When the IP Phone is physically disconnected,[12] the current loop is broken and the relays automatically move back to the "off" position. The Inline Power Switch recognizes the absence of data pulses and link integrity pulses and opens the control switch to turn off power to the port. The phone discovery process then begins again. Consequently, the next device that is connected to the port, which may or may not be an IP Phone, will not automatically receive inline power.

If an IP Phone uses a local AC power supply called a "brick" and therefore does not need inline power, it will not send back the special discovery pulse. The relays in the IP Phone will be held in the "on" position to communicate data with the Inline Power Switch normally.

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[11]A device that is not equipped for inline power will not loop the special discovery pulse back. Hence, the Inline Power Switch will not supply inline power to devices that do not require it.

[12]The IP Phone apparently does not have an "on/off" button. Physical disconnection of the cable is necessary to cut off inline power.

3. Power Patch Panels

The Power Patch Panel is a device that effectively adds inline power capability to older non-inline power switches. It is a "midspan" device inserted between the preexisting switch and remote connected devices.

Normal data communication using the Power Patch Panel occurs directly over wires 1, 2, 3, and 6. Phone discovery, however, occurs over "spare" wires 4, 5, 7, and 8. Instead of using the special discovery pulse, the Power Patch Panel sends out an AC tone over wires 7 and 8. The IP Phone permanently loops the signal back over wires 4 and 5. When the Power Patch Panel receives the proper loopback signal, it begins delivering inline power over wires 4, 5, 7, and 8. When the IP Phone is disconnected, the Power Patch Panel recognizes the absence of the loopback signal and turns off inline power.

C. Special Master's Report and Recommendations

Both parties moved for summary judgment subsequent to the Markman decision. Because of the complexity of the subject matter and the volume of motion papers, the Court referred the pending motions to a Special Master, Paul M. Janicke.[13] The Special Master received the motion papers, conferred with the parties, asked technical questions to better understand the technology, and conducted a lengthy hearing. The Special Master issued his report on April 30, 2003 recommending that the Court deny Chrimar's motion and grant both of Cisco's motions. Specifically, the Special Master made the following recommendations:

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[13] See Amended Appointment and Order of Reference to Special Master (January 23, 2003).

- Cisco's motion for summary judgment of invalidity should be granted because there are no genuine issues of material fact and Cisco has presented clear and convincing evidence of invalidity so that no reasonable jury could find otherwise.
    - Claim 1 of the '260 patent is invalid as anticipated by two "printed publications" under 35 U.S.C. § 102(b).
        - Both references contain enabling disclosures of every limitation in claim 1 (current loop means, source means, detector means).
        - Both references are "printed publications" for the purposes of 35 U.S.C. § 102(b).
    - Claim 1 is invalid based on prior use under 35 U.S.C. § 102(a).
    - Claim 1 is invalid based on prior knowledge under 35 U.S.C. § 102(a).
    - Claim 1 is not invalid based on prior invention under 35 U.S.C. § 102(g)(2).
- Cisco's motion for summary judgment of noninfringement should be granted and Chrimar's motion for summary judgment of infringement should be denied because there are no genuine issues of material fact as to whether Cisco's products infringe claim 1 literally or equivalently.
    - The "current loop means" limitation is literally met by the Inline Power Switch arrangement but not by the Power Patch Panel arrangement because the Power Patch Panel arrangement does not have a current loop over "data communication lines."
    - The "source means" limitation is literally met by the Cisco devices.
    - The "detector means" limitation is not literally met by the Cisco devices.
    - The "detector means" limitation is not met by the Cisco devices under the doctrine of equivalents.

Both parties filed objections to the Special Master's Report and Recommendations.[14]

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[14]Cisco argues in its objections that the Special Master misunderstood the technical aspects of the claimed invention. However, as evidenced by the extensive papers produced by the parties explaining the technology, the detailed questions posed by the Special Master to the experts, and the Report and Recommendations itself, the Special Master clearly understood the technology involved and issued a well-reasoned

The Court held a hearing on the objections on February 20, 2004. The parties then filed supplemental papers detailing their arguments at the hearing.

III. Legal Standards

A. Standard of Review

The Amended Appointment and Order of Reference to Special Master of January 23, 2003 stated that "[r]eview of the recommendations of the Special Master by the Court shall be governed by 28 U.S.C. § 636(b)(1)(B) and ([C])," which provide:

> Within ten days after being served with a copy, any party may serve and file written objections to such proposed findings and recommendations as provided by rules of court. A judge of the court shall make a **de novo determination of those portions of the report or specified proposed findings or recommendations to which objection is made**. A judge of the court may accept, reject, or modify, in whole or in part, the findings or recommendations made by the magistrate judge. The judge may also receive further evidence or recommit the matter to the magistrate judge with instructions.

Together, Chrimar and Cisco object to nearly every paragraph of the Special Master's Report and Recommendations.[15] Consequently, while the discussion which follows relies in part on the Special Master's findings and in part on analysis by the Court, it is necessary for the Court to evaluate both parties' arguments de novo.

B. Summary Judgment

Summary judgment is appropriate when the moving party demonstrates that there is "no genuine issue as to any material fact and that the moving party is entitled to a judgment as a matter of law." Fed. R. Civ. P. 56(c). There is no genuine issue of

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and thorough report.

[15]Notwithstanding, the approach the parties have taken to the Special Master's Report and Recommendations has been helpful to the Court.

material fact when "the record taken as a whole could not lead a rational trier of fact to find for the non-moving party." Matsushita Elec. Indus. Co. v. Zenith Radio Corp., 475 U.S. 574, 587 (1986).

The Court must decide "whether the evidence presents a sufficient disagreement to require submission to a [trier of fact] or whether it is so one-sided that one party must prevail as a matter of law." In re Dollar Corp., 25 F.3d 1320, 1323 (6th Cir. 1994) (quoting Anderson v. Liberty Lobby, Inc., 477 U.S. 242, 251-52 (1986)). In so doing, the Court "must view the evidence in the light most favorable to the non-moving party." Employers Ins. of Wausau v. Petroleum Specialties, Inc., 69 F.3d 98, 101 (6th Cir. 1995). Only where there are no genuine issues of material fact and the moving party is entitled to judgment as a matter of law may summary judgment be granted. Thompson v. Ashe, 250 F.3d 399, 405 (6th Cir. 2001). If a nonmoving party cannot establish a genuine issue for trial on any essential element of her claim, then the moving party is entitled to summary judgment. See Celotex Corp. v. Cartrett, 477 U.S. 317, 322-23 (1986).

C. Invalidity

A patent enjoys a presumption of validity under 35 U.S.C. § 282. Consequently, "a moving party seeking to invalidate a patent at summary judgment must submit such clear and convincing evidence of invalidity so that no reasonable jury could find otherwise." Eli Lilly & Co. v. Barr Labs., 251 F.3d 955, 962 (Fed. Cir. 2001). Lack of novelty is one reason that a patent may be invalid. "Although anticipation [under 35 U.S.C. § 102] is a question of fact, it still may be decided on summary judgment if the record reveals no genuine dispute of material fact." Telemac Cellular Corp. v. Topp

Telecom, Inc., 247 F.3d 1316, 1327 (Fed. Cir. 2001).

"A rejection for anticipation under section 102 requires that each and every limitation of the claimed invention be disclosed in a single prior art reference." In re Paulsen, 30 F.3d 1475, 1479 (Fed. Cir. 1994); see Advanced Display Sys. v. Kent State Univ., 212 F.3d 1272, 1282 (Fed. Cir. 2000) ("invalidity by anticipation requires that the four corners of a single, prior art document describe every element of the claimed invention, either expressly or inherently, such that a person of ordinary skill in the art could practice the invention without undue experimentation"). "The principle of law is concisely embodied in the truism that: 'That which infringes if later anticipates if earlier.'" Brown v. 3M, 265 F.3d 1349, 1352 (Fed. Cir. 2001) (citations omitted). Every prior art reference "must be 'considered together with the knowledge of one of ordinary skill in the pertinent art.'" In re Paulsen, 30 F.3d at 1480 (citations omitted).

D. Infringement

The infringement inquiry requires a comparison of the asserted claim with the allegedly infringing device. Kemco Sales, Inc. v. Control Papers Co., 208 F.3d 1352, 1359 (Fed. Cir. 2000). To prove infringement, the patentee must establish that the accused device contains each limitation of the asserted claim, Mas-Hamilton Group v. LaGard, Inc., 156 F.3d 1206, 1211 (Fed. Cir. 1998), or an equivalent of each limitation, Warner-Jenkinson Co. v., Hilton Davis Chemical Co., 520 U.S. 17, 40 (1997). The determination of infringement, both literal and under the doctrine of equivalents, is a question of fact. Teleflex, Inc. v. Ficosa North America Corp, 299 F.3d 1313, 1323 (Fed. Cir. 2002).

1. Literal Infringement

Literal infringement requires that the accused device embody exactly each limitation of the asserted claim. Laitrim Corp. v. Rexnord, Inc., 939 F.2d 1533, 1535 (Fed. Cir. 1991).

2. Infringement by Equivalents

Infringement under the doctrine of equivalents requires that the accused device contain each limitation of the asserted claim or its equivalent. See Warner-Jenkinson, 520 U.S. at 40 (noting that because each limitation contained in a claim is material to defining the scope of the patented invention, the doctrine of equivalents analysis must be applied to individual claim limitations, not to the invention as a whole). An element in the accused device is equivalent to a claim limitation if the differences between the two are "insubstantial" to one of the ordinary skill in the art. See id. Relevant to an insubstantial difference inquiry is whether the missing element in the accused device "performs substantially the same function in substantially the same way to obtain the same result" as the asserted claim limitation. Graver Tank & Mfg. Co. v. Linde Air Prods. Co., 339 U.S. 605, 608 (1950); see also Warner-Jenkinson, 520 U.S. at 39-40.

IV. Validity

A. Asserted Grounds for Anticipation

Cisco says that claim 1 is invalid for anticipation based on the following provisions of 35 U.S.C. § 102:

> (a) the invention was known or used by others in this country, or . . . described in a printed publication in this or a foreign country, before the invention thereof by the applicant for patent, or

> (b) the invention was . . . described in a printed publication in this or a foreign country . . . more than one year prior to the date of the application for patent in the United States, or
>
> . . . .
>
> (g)(2) before such person's invention thereof, the invention was made in this country by another inventor who had not abandoned, suppressed, or concealed it. . . .

Cisco points to two prior art publications to establish that the invention of the '260 patent was previously invented, publicly known, in use, and described:

- Advanced Micro Devices, Inc. et al., An Interoperable Solution for FDDI Signaling Over Shielded Twisted Pair (May 21, 1991) ("Green Book")
- Eugen Gershon, FDDI on Copper with AMD PHY Components, Advanced Micro Devices, Inc. Publication No. 15293 (June 1991) ("AMD Application Note")

B. The Two References[16]

1. Green Book

Fiber Distributed Data Interface (FDDI), a high speed computer network that transmits data as pulses of light along thin glass fibers rather than as electrical signals along copper wires, was first developed in the late 1980s. Three international standards for FDDI networks were defined by May 1991.

FDDI uses a logical counter-rotating ring[17] network topology. There are two

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[16]The Green Book and the AMD Application Note were not considered as prior art during prosecution of the '260 patent.

[17]A network may be described by its logical topology (how the stations communicate) or by its physical topology (how the cables are arranged). A "ring" network is one where each set of data communication lines links exactly two computers to each other and each computer on the network communicates with other computers by transmitting data packets over the data communication lines around the ring. A

types of nodes in a FDDI network: single attachment stations (SAS), which are usually ordinary workstations, and dual attachment stations (DAS), which are usually "concentrators." A concentrator is a device on the ring with "A" and "B" ports to connect to the FDDI ring in both directions. It also has additional ports to connect to other nodes, such as individual workstations and other concentrators. These "Master" or "M-ports" connect to "Slave" or "S-ports" in the other nodes. When data comes into the concentrator from the main ring, it is forwarded through the M-ports to other nodes, which are connected to the concentrator in a star configuration. Thus, FDDI allows other stations access to the primary ring.[18]

FDDI networks suffered from two disadvantages: fiber optic cables were more expensive than copper wires and copper wires were already present in most buildings. Hence, some members of the telecommunications industry proposed the extension of FDDI networks into buildings using the existing shielded twisted pair (STP) copper wires that were already in place and FDDI protocols, which was referred to as "FDDI-STP interoperability." A number of companies then created working prototypes. Beginning in 1990, representatives from five companies–SynOptics Communications, Inc. (SynOptics), Advanced Micro Devices, Inc. (AMD), Chipcom Corporation (Chipcom),

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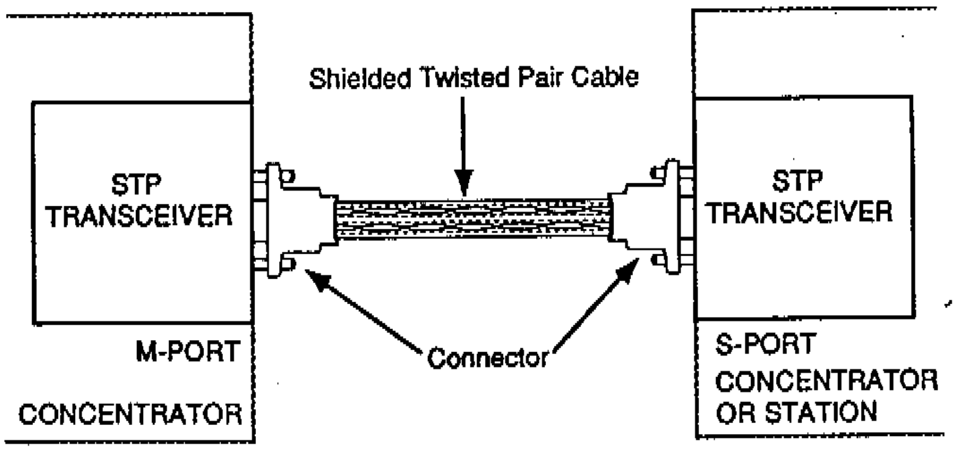
counter-rotating ring network simply uses two rings where data flows in opposite directions. By contrast, in a "star" network, each computer is connected to a central point of interconnection called a "hub" through which the computers communicate with each other. Data packets go to the central node then to the destination computer rather than through other computers on the network.

[18]As Chrimar's expert, Dr. Yang Zhao, points out, although individual computers are physically connected to the concentrator in a star configuration, logical data flow actually occurs in a ring fashion from one computer to the next computer downstream. This is called a "star-cabled ring" network.

Digital Equipment Corporation (DEC), and Motorola, Inc. (Motorola)–decided to collaborate and agree upon a single solution for locally communicating with FDDI networks via STP cable, which they would make open to the industry.

The culmination of the work of these five companies was the Green Book, which outlined a solution for connecting the S-port of a workstation to the M-port of a FDDI concentrator through the STP cable that was already in place in many buildings.[19] The optical transceivers used at the M-ports and S-ports for converting optical signals into electrical signals were replaced with electrical transceivers, as shown in Figure 1:

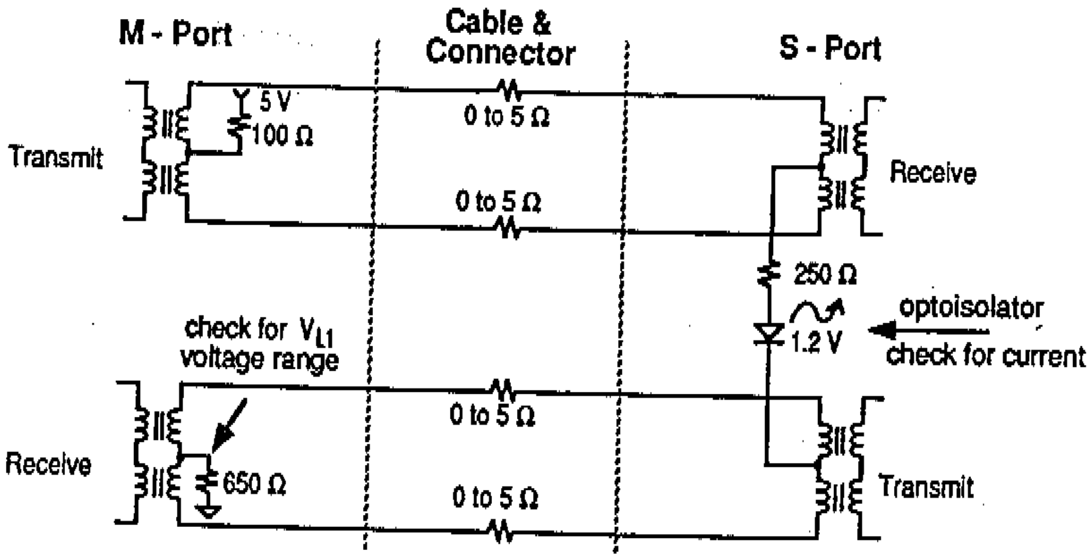


Shielded Twisted Pair FDDI Overview
Figure 1

[19]The American National Standards Institute (ANSI), a non-profit organization that supervises the standardization process for particular technologies, also created a committee to debate and draft a standard for FDDI-STP interoperability called the ANSI X3T9.5 Ad Hoc Twisted-Pair-Physical Layer Medium Dependent Committee (X3T9.5 TP-PMD Committee). The X3T9.5 TP-PMD Committee created a working group for engineers to meet and discuss proposed standards, which operated from 1990 to 1991. Many of the same engineers from the X3T9.5 TP-PMD Committee were also involved in drafting the Green Book. However, as Chrimar correctly points out, the X3T9.5 TP-PMD Committee itself did not draft the Green Book. Cisco says that the creators of the Green Book "are appropriately viewed as a subgroup of the committee," which Chrimar disputes. Regardless, the relationship between the drafters of the Green Book and the X3T9.5 TP-PMD Committee is not determinative of the invalidity issue.

Thus, the concentrator could communicate with other DASs over high speed fiber optic cable while communicating with individual workstations through lower cost STP cable.

The Green Book also specified a "cable detect function" for detecting whether a workstation and its associated communications cable were properly connected to the FDDI concentrator. The "cable detect function" was one half of a broader "link detect function" that also detected the presence of a sufficient received signal. A model "cable detect" circuit is shown in Figure A-2:



Cable Detect Implementation Example 2
Figure A-2

The M-port of the concentrator connects through two STP lines (transmit pair and receive pair) to an S-port. The concentrator itself has a 5 volt power supply. A "4 mA nominal phantom current" (which does not interfere with normal data signals) is looped from the concentrator's power source through a 100 ohm resistor in the M-port, across the STP connection to the S-port, through the transformers in the S-port, through a 250 ohm resistor and an optoisolator in the S-port, back across the STP connection, and

through a 650 ohm resistor connected to ground in the M-port. Consequently, the voltage V_{L1} across the 650 ohm resistor can be measured to determine connection. The Green Book states that V_{L1} is "2.5 V with a properly connected link, 4.3 V with the loopback case, and 0V with broken wires."

2. AMD Application Note

Eugen Gershon was an engineer for AMD who was part of the collaborative effort that resulted in the Green Book. Subsequent to the completion of the Green Book, Gershon authored the AMD Application Note, which has an "Issue Date" of June 1991 on its cover. The AMD Application Note shows one specific implementation for the "cable detect" circuit:

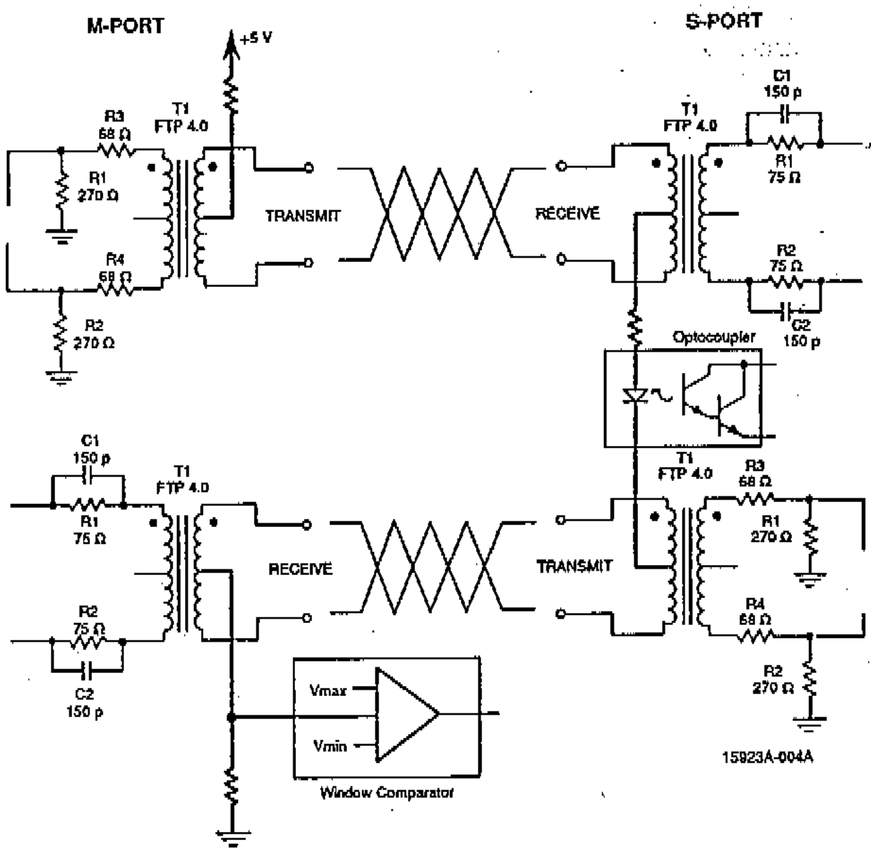


Figure 4. The Simple Option for Cable Continuity Detection

The AMD Application Note states that "[a]n —port needs to check that the voltage across the resistor is within a 'window.' A low voltage indicates no connection; a high voltage indicates a loop-back condition. In both cases cable continuity signal is 'false.'"

The AMD Application Note specifically references the Green Book by stating that "[t]he circuit described meets the electrical specification of the interoperable solution (PID 16011A) endorsed by AMD, Chipcom, DEC, Motorola, and SynOptics."

C. Analysis

1. Anticipation[20]

To prove anticipation by a printed publication, Cisco must show that the Green Book discloses every limitation of claim 1 and "enable[s] one skilled in the art to make the anticipating subject matter." PPG Indus., Inc. v. Guardian Indus. Corp., 75 F.3d 1558, 1566 (Fed. Cir. 1996); see Schering Corp. v. Geneva Pharms., Inc., 339 F.3d 1373, 1379-80 (Fed. Cir. 2003). Cisco says that the Green Book discloses in an enabling way the current loop means, source means, and detector means limitations of claim 1 of the '260 patent. Chrimar says that it does not.

a. Current Loop Means

Claim 1 requires:

> current loop means including separate current loops associated with different pieces of monitored equipment,
>
> each of said current loops employing a pair of data

[20]As the Special Master found, the AMD Application Note contains a more detailed disclosure of the "cable detect" circuit, which is similar to that of the Green Book. Chrimar does not object to this finding. Consequently, the AMD Application Note is at least as enabling as the Green Book. The Court will refer to the Green Book in this section; the analysis applies equally to the AMD Application Note.

> communication lines which connect one of the associated pieces of equipment to the network and which are coupled to existing internal circuitry within the associated piece of monitored equipment,
>
> and wherein respective pairs of data communication lines are associated with different ones of the associated pieces of equipment.

The "current loop means" has been interpreted as "multiple current loops with each loop associated with a corresponding piece of electrical equipment. Each of the current loops is a pair of data communication lines that connect the corresponding piece of electronic equipment to a network through existing internal circuitry."

Cisco says that the "current loop means" is met because the Green Book discloses "multiple current loops, each loop including pairs of copper data communication lines contained in the cable that connect individual computers to the FDDI network via the concentrators." In response, Chrimar argues that the Green Book is not enabling of "current loop means" for two reasons.

i. "Network"

Chrimar says that the Green Book does not enable a "network." Network components, such as concentrators and network interface cards (NIC),[21] allow computers to talk to other computers on the network. According to Dr. Zhao, a working FDDI-over-STP "network" could not be constructed based on the Green Book because

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[21]A typical NIC has Physical Medium Dependent (PMD) components, which are necessary to interpret signals that travel over the communications medium. The particular components differ depending on what type of communications medium is used. For instance, when optical fibers are used in a FDDI network, an optical fiber PMD is required. When STP cabling connects a node to a network, a different PMD must be used.

it does not disclose how to make a FDDI-over-STP concentrator or a FDDI-over-STP NIC. One skilled in the art could not construct a network without this information.

Enablement of an entire network, however, is not necessary. In Constant v. Advanced Micro-Devices, Inc., 848 F.2d 1560, 1569 (Fed. Cir. 1988), the patentee argued that his patent for an integrated circuit chip was not anticipated by a specification sheet for an Intel chip because the specification sheet did not "describe a computer program to make the [chip] operational." The claims of his patent concerned hardware configurations and did not suggest that a computer program was part of the invention. Id. Because the prior art chip was "at least at the same level of technical detail as the disclosure in the . . . patent," specific computer programs were irrelevant. Id.; see also General Elec. Co. v. Hoechst Celanese Corp., 740 F. Supp. 305, 317 (D. Del. 1990).

Claim 1 of the '260 patent is directed to a system for detecting disconnection of electronic equipment from a computer network. Pieces of equipment are connected to the network through data communication lines such that disconnection can be detected. Claim 1 does not require a specific type of network or enable one to construct a full network; the specification merely states that an Ethernet network may be used. See '260 patent, col. 3, ll. 17-19. Like the patent at issue in Constant, which presumed the existence of software to operate the chip, claim 1 presumes the existence of a network to make the invention work. The patented invention is the system for detecting disconnection from a network, not the network itself. As the Special Master analogized, "there is no more need to teach how to build a network than there would be for a carburetor reference to teach how to make a car or for home anti-burglary literature to

teach how to build a house." The Green Book is at least at the same level of technical detail as the '260 patent and does not need to enable an entire network to anticipate claim 1.

Moreover, even if enablement of a "network" were required, the Green Book discloses how to create a traditional local area network (LAN) by connecting a workstation to a FDDI concentrator through STP cable in a star configuration. The concentrator is linked to the rest of the FDDI network. As the Green Book states, the interoperable "solution is a direct replacement for the existing optical PMD." The AMD Application Note also points out (emphasis added):

> This interoperable solution (IOS) is designed to minimize the cost of FDDI connections confined within 100 meter range by replacing the optical transceiver and fiber with a shielded twisted pair (STP) transceiver and STP cabling. If a design utilizes AMD's SUPERNET 1 or SUPERNET 2 chipsets, **no major changes are required**; only a simple interface circuit from the PHY transmitter to the cable and another interface from the cable to the PHY receiver are necessary.

Thus, the only changes needed to implement the Green Book design in a working FDDI-over-STP network were the use of STP cables instead of optical fiber and the replacement of the optical transceiver (PMD) in the FDDI NIC with an electrical transceiver (PMD). Otherwise, existing FDDI technology could be used. See In re Paulsen, 30 F.3d 1475, 1480 (Fed. Cir. 1994) ("a prior art reference must be 'considered together with the knowledge of one of ordinary skill in the pertinent art'"). Cisco says that while it was unable to locate a physical example FDDI-over-STP NIC, it is undisputed that a demonstration was conducted on May 21, 1991 where the M-port of a concentrator was connected by copper wire to the associated S-port of an individual computer to form a network. See infra Part IV.C.2-3. Cisco has also

produced a photograph of a FDDI-over-STP NIC made by AMD. Hence, the Green Book fully discloses all of the necessary elements to make a "network."

Chrimar also argues for the first time in its objections to the Special Master's Report and Recommendations that because a FDDI-over-STP NIC was never created, the Green Book does not disclose data communication lines connected to "existing internal circuitry" within the computer. Existing internal circuitry is "circuitry present in the monitored piece of electronic equipment at the time the end user acquires it." Cisco, by contrast, points out that Chrimar admitted that the center-tapped isolation transformers in the Green Book's monitored equipment constitute existing internal circuitry. Chrimar also admits that SynOptics engineers tested and demonstrated that the Green Book "cable detect" circuit, with the isolation transformers, worked. The center-tapped isolation transformers in the Green Book clearly constitute "existing internal circuitry."

ii. "Associated with Different Ones"

Claim 1 requires "respective pairs of data communication lines [that] are associated with different ones of the associated pieces of equipment." Chrimar says that this limitation requires a "one-to-one" association between each set of data communication lines and a piece of equipment. Chrimar says that this association is found in a star network but not in a ring network because each set of data communication lines in a ring network is actually associated with two different computers, creating a "two-to-two" association.[22] According to Chrimar, the Green Book

[22]Notably, Chrimar did not argue during the <u>Markman</u> phase of the case that the term "network" means a star network and not a ring network. Chrimar says that the

discloses a ring network.

Traditional FDDI is a logical ring network. It is undisputed that the Green Book FDDI-over-STP implementation is a physical star configuration with logical ring data flow. The '260 patent also describes a physical star configuration but, as Cisco correctly points out, never speaks to logical data flow:

> The invention described herein is particularly suited to be implemented in conjunction with a computer network 10 which preferably employs a **conventional wiring approach** of the type which may include 10BaseT wiring. **Wiring schemes** of the 10BaseT type are commonly employed to provide data communication lines for electronic computer equipment. In accordance with **conventional wiring approaches**, data communication link 14 generally includes a plurality of pairs of transmit wires 44 and 46 as well as a plurality of pairs of receive wires (not shown) connected to each of personal computers 12a through 12d.

'260 patent, col. 3, ll. 31-42 (emphasis added). How the data actually flows in the network is irrelevant; claim 1 only requires that a physical data communication line pair be associated with one particular piece of equipment. In the "cable detect" circuit, the upper and lower pairs of wires extend from the M-port of the concentrator to the S-port of one particular piece of equipment. Further, data flows directly between the equipment and the concentrator in a FDDI-over-STP network (rather than directly between adjacent workstations on the ring) just as it does between the equipment and the hub in the '260 patent; hence, there is at least a one-to-one correspondence between the data communication lines connecting the concentrator and the equipment from the logical perspective as well. Chrimar has not given any reason why logical ring data flow throughout the entire FDDI-over-STP network makes a piece of equipment

customary and ordinary meaning of the words "associated with different ones" is a star network and not a ring network.

"associated" with two data communication line pairs when it is undisputed that in the Green Book, an M-port is directly connected to the S-port of only one piece of equipment.

The Green Book contains an enabling disclosure of "current loop means" because it discloses a current loop over a pair of data communication lines that connect a piece of electronic equipment to a network through existing internal circuitry. Enablement of the associated network is not required. The Green Book discloses pairs of data communication lines (STP cable) physically connected to one particular piece of equipment.

b. Source Means

"Source means" has been interpreted to mean a DC power source that is capable of generating low DC current in the multiple current loops. The corresponding structure in the '260 patent is input terminal 25 and isolation power supply 26.

The Green Book uses a 5 volt DC power supply to inject DC current onto the data communication lines, which corresponds to input terminal 25 and isolation power supply 26 in the '260 patent. Chrimar does not dispute this. Hence, there is a source means in the Green Book.

c. Detector Means

Claim 1 requires "detector means for monitoring the current signal through each of said current loops and detecting a change in said current signal through one of said current loops which represents disconnection of said associated piece of equipment from the network." The "detector means" has been interpreted to mean:

> One or more electronic components capable of providing an indication of a change in current flow which represents disconnection of a piece of electronic equipment from the network. The indication need not be human-perceptible.

The corresponding structure in the '260 patent is resistor R_2.

Cisco says that the 650 ohm resistor in the Green Book is a "detector means" because it is in the same circuit position as resistor R_2 in the '260 patent and different voltages are produced across it depending on whether current is flowing in the loop.

Chrimar does not dispute the location and use of the 650 ohm resistor but instead argues that disconnection in the "cable detect" circuit is not represented by a single and unambiguous change in current like in the '260 patent. Rather, there are three possible voltage levels across the 650 ohm resistor. One voltage level occurs when the computer is connected to the concentrator, while two different voltage levels can occur when the computer is disconnected. Therefore, the voltage level has no meaning until an op-amp comparator compares it to two preset voltage references, which is unlike the '260 patent detecting a change from current flow to no current flow. Consequently, Chrimar says that the "cable detect" circuit cannot detect "a change" in current that represents disconnection.

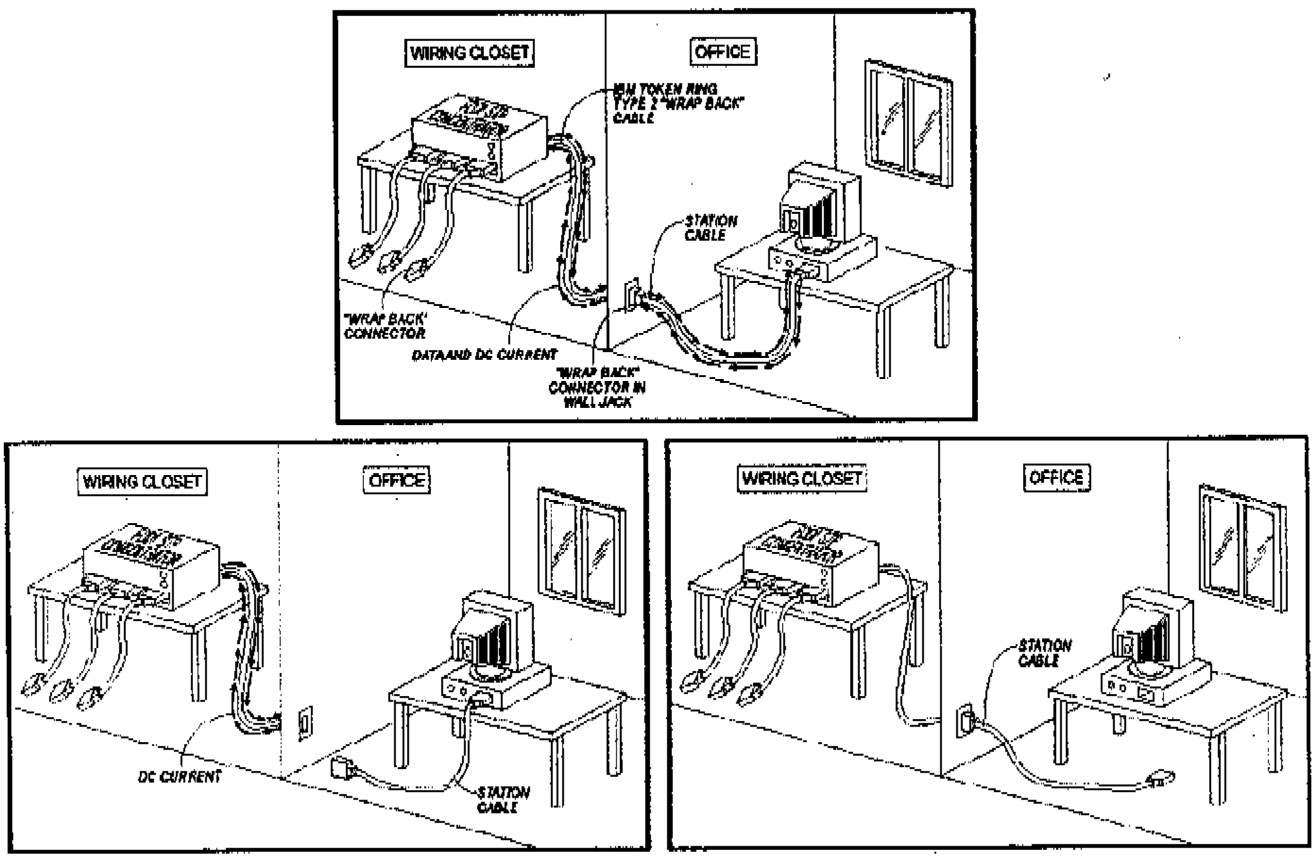
The Green Book discloses the use of a STP cable between the M-port of a concentrator and the S-port of a workstation. In typical token ring networks, "wrap-back" connectors are used at each end of a STP cable. The wrap-back connectors are used to mechanically seal the ring and allow communication down the line when one computer is disconnected from the network. The Green Book states that "[i]t is likely that an existing cable plant will be used with the IEEE 802.5 [wrap-back] connector

which loops back. This loopback condition shall be detected and link detect shall be de-asserted for both the M-Port and S-Port." Detection is accomplished by checking the voltage at V_{L1}, which is "2.5 V with a properly connected link, 4.3 V with the loopback case, and 0 V with broken wires." According to Dr. Zhao, these voltage levels occur in the following scenarios and are depicted in the following diagram:

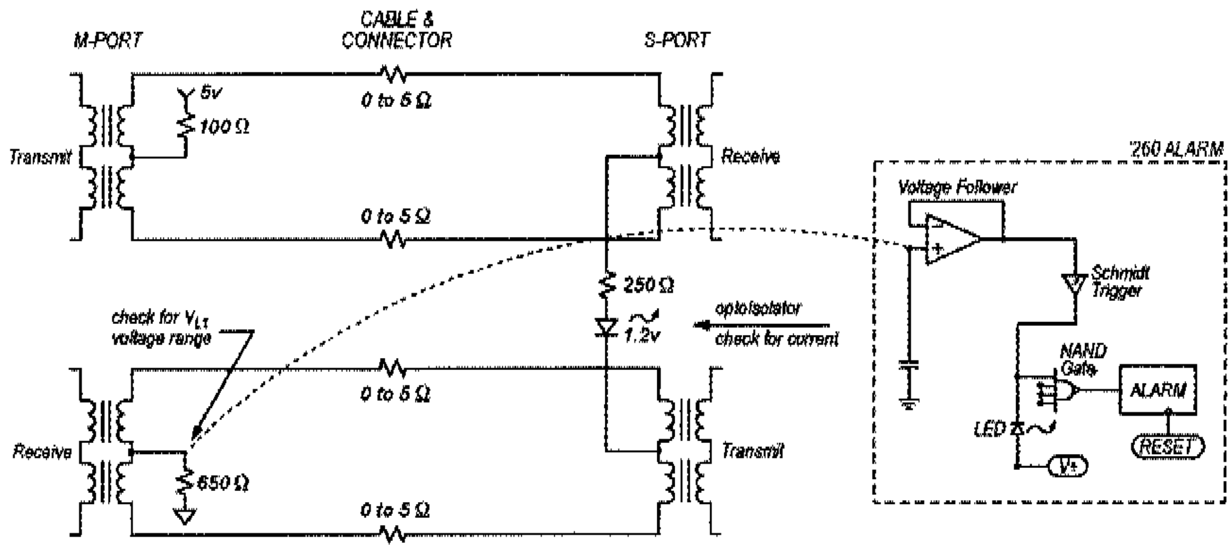
- If a computer was fully connected to the cable and wall jack with a wrap-back connector, current would flow from the concentrator to the computer and back resulting in a voltage signal of 2.5 V (top diagram).

- If the cable was disconnected from the wall jack, current would continue to flow because the wrap-back connector in the wall jack sealed the ring resulting in a voltage signal of 4.3 V (bottom-left diagram).

- If the computer itself was disconnected from the cable but the cable remained connected to the wall jack, the current loop would be broken resulting in a voltage signal of 0 (bottom-right diagram).



Chrimar also conducted a physical demonstration at the hearing (and provided a videotape of the same demonstration) to show this difference between the '260 patent and the Green Book. Specifically, Chrimar built the "cable detect" circuit shown in Figure A-2 of the Green Book and added part of the '260 patent preferred embodiment (op-amp, Schmitt trigger, NAND gate, LED, and audible alarm) downstream of the 650 ohm resistor, as shown in the following circuit diagram:



Chrimar also created a card which it says replicates the S-port at the computer. With the computer fully connected to the cable and wall jack with a wrap-back connector, the 650 ohm resistor properly registered a voltage signal and no alarm was activated. When the computer was disconnected from the cable, an alarm was appropriately generated because the current loop was broken. However, when the cable was disconnected from the wall jack, no alarm was generated due to the presence of the wrap-back connector. Thus, even though the computer was disconnected, the 650

ohm resistor did not detect a change in current.[23] Consequently, Chrimar says that the "cable detect" circuit does not produce a one-to-one correspondence between a change in current and disconnection.

Essentially, Chrimar argues that unlike resistor R_2, which only generates two different signals, the 650 ohm resistor in the "cable detect" circuit is not capable of providing an indication of "a change" in current representing disconnection because it produces three different voltage signals depending on how a computer is connected or disconnected.

Chrimar's argument lacks merit for three reasons.

First, Chrimar improperly focuses on the circuitry downstream of the 650 ohm resistor that measures the V_{L1} voltage signal. Like the '260 patent, circuitry downstream of a resistor determines how to respond to a change in the current signal. However, that circuitry is not part of the structure corresponding to the "detector means" in the '260 patent. The "cable detect" circuit checks the V_{L1} voltage signal to determine if a computer is disconnected–it is 2.5 V when connected and 0 V when disconnected. The demonstration confirmed that the Green Book works for this purpose because the alarm sounded when the computer was disconnected from the cable. As the Special Master correctly recognized, the fact that later circuitry can **also** detect the operation of a wrap-back connector (through a 4.3 V signal) does not mean that the 650 ohm resistor is not a "detector means." See In re Donohue, 766 F.2d 531, 534 (Fed. Cir. 1985) ("an anticipation rejection requires a showing that each limitation of a claim must be found in

[23]Chrimar also demonstrated that when the cable was reconnected to the wall jack, an alarm was inappropriately generated even though there was no disconnection.

a single reference, practice, or device"); Mossman v. Broderbund Software, Inc., 51 U.S.P.Q.2d 1752, 1757-58 (E.D. Mich. 1999) ("if all of the elements . . . are included in the prior art reference, the claim is anticipated even if additional elements are used in the reference"). Of course, because of this additional capability, a circuit intermixed with part of the "cable detect" circuit and part of the '260 patent preferred embodiment might not "work" in the same way that the '260 patent preferred embodiment works by itself, but the 650 ohm resistor is still capable of providing an indication of a change in current flow from 2.5 V to 0 V, which represents disconnection of a computer.

Second, contrary to Dr. Zhao's assertions, the Green Book does not say that the use of wrap-back connectors is essential; it merely says that it is "likely" that a cable with wrap-back connectors will be used. Further, Chrimar has not cited the testimony of any witness personally familiar with the creation of the Green Book who claims that the sole embodiment of the Green Book used wrap-back connectors. When wrap-back connectors are not used, there are only two possible V_{L1} voltage levels. In that case, the 650 ohm resistor would operate exactly the same as resistor R_2 if the alarm circuitry of the '260 patent preferred embodiment were added downstream.

Third, reducing the Green Book to practice and then substituting it for part of the '260 patent preferred embodiment to see if the circuit still "works" is not an appropriate mode of analysis for anticipation. To anticipate, a written reference must disclose every limitation of a claimed invention. In re Donohue, 766 F.2d at 533. Anticipation, however, does not require that a reference teach what the patent teaches; it only requires that the claims "'read on' something disclosed in the reference, i.e., all limitations of the claim are found in the reference, or 'fully met' by it." Kalman v.

Kimberly-Clark Corp., 713 F.2d 760, 772 (Fed. Cir. 1983). Thus, just as infringement is determined by comparing the allegedly infringing device with the asserted claim (not just the preferred embodiment), anticipation must also be determined by comparing the anticipatory reference to the language of the claim as interpreted by the Court (not just the preferred embodiment). Here, the 650 ohm resistor is capable of providing an indication of a change in current flow from 2.5 V to 0 V, which represents disconnection of a computer. That is all that is needed to meet the "detector means" limitation of claim 1.

The Green Book contains an enabling disclosure of "detector means" because the disclosed "cable detect" circuit is capable of providing an indication of a change in current flow which represents disconnection of a piece of electronic equipment from the network. The additional capability of detecting the operation of a wrap-back connector does not mean that the Green Book does not anticipate the claimed invention.

2. § 102(a) and § 102(b): Printed Publications

A claim is anticipated if the patented invention was "described in a printed publication" before the date of invention, 35 U.S.C. § 102(a), or "described in a printed publication" more than one year prior to the date of application of the patent, 35 U.S.C. § 102(b). For the purposes of 35 U.S.C. § 102(a), Chrimar admits that the conception date for the '260 patent is no earlier than November 1991. For the purposes of 35 U.S.C. § 102(b), the critical date is December 18, 1991, one year prior to the '260 patent's application date.

Cisco has submitted declarations from numerous third-party witnesses who state that the Green Book and the AMD Application Note are "printed publications." Chrimar

has not produced evidence from any of its own fact witnesses to dispute the facts stated by Cisco's witnesses, nor has Chrimar deposed any of Cisco's witnesses.[24] Rather, Chrimar challenges the sufficiency of Cisco's proof as clear and convincing evidence of invalidity.

"In cases like the present one, where there are no disputed factual issues, the question whether particular material is a 'printed publication' is a question of law." In re Cronyn, 890 F.2d 1158, 1159 (Fed. Cir. 1989); In re Hall, 781 F.2d 897, 899 (Fed. Cir. 1986). To be a "printed publication," a reference must have "been disseminated or otherwise made available to the extent that persons interested and of ordinary skill in the subject matter or art, exercising reasonable diligence can locate it and recognize and comprehend therefrom the essentials of the claimed invention without need of further research or experimentation." Massachusetts Inst. of Tech. v. AB Fortia, 774

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[24]The Federal Circuit has explained:

> While the burden of persuasion on the issue of invalidity also rests throughout the litigation with the party asserting invalidity, **if evidence is presented establishing a prima facie case of invalidity, the opponent of invalidity must come forward with evidence to counter the prima facie challenge to the presumption of section 282**. This requirement is in no way contrary to the procedural role of the presumption of validity. Nor does it in substance shift the burden of persuasion on the issue. In the end, the question is whether all the evidence establishes that the validity challenger so carried his burden as to have persuaded the decisionmaker that the patent can no longer be accepted as valid.

Cable Elec. Prods., Inc. v. Genmark, Inc., 770 F.2d 1015, 1022 (Fed. Cir. 1985) (citations and quotation marks omitted; emphasis added), overruled on other grounds by Midwest Indus., Inc. v. Karavan Trailers, Inc., 175 F.3d 1356, 1358-59 (Fed. Cir. 1999); see also Sinskey v. Pharmacia Ophthalmics, Inc., 982 F.2d 494, 498 (Fed. Cir. 1992) ("On summary judgment, once an alleged infringer has presented facts sufficient to establish a prima facie case of public use, it falls to the patent owner to come forward with some evidence to the contrary sufficient to raise a genuine issue of material fact.").

F.2d 1104, 1109 (Fed. Cir. 1985) (citing In re Wyer, 655 F.2d 221, 226 (C.C.P.A. 1981)). Evidence of both actual dissemination and public accessibility are relevant to determining whether a reference was published. Constant, 848 F.2d at 1568. "If accessibility is proved, there is no requirement to show that particular members of the public actually received the information." Id. at 1569. Indeed, "[v]ery little circulation or permanency is required if the work is specially directed to those skilled in the art or trade to which the patent in question relates." 1-3 Chisum on Patents § 3.04[2] (2003) (citing Cooper Cameron Corp. v. Kvaerner Oilfield Prods., Inc., 291 F.3d 1317, 1324 (Fed. Cir. 2002)). The public policy behind the "printed publication" bar is that "once an invention is in the public domain, it is no longer patentable by anyone." In re Hall, 781 F.2d at 898.

a. Green Book

Cisco says that the Green Book was published on May 21, 1991 when representatives from the five companies held a technology demonstration at DEC's facilities in Littleton, Massachusetts. Michael Howard, who moderated the demonstration, said that there were 30-50 "interested engineers, company representatives, and members of the press" in attendance. Howard recalled that invitations were sent by mail and e-mail to "FDDI manufacturers and trade press" prior to the demonstration. The companies provided concentrators and multiple computer workstations, which were connected to form a LAN that, according to Cisco, implemented the Green Book design. Numerous third-party witnesses stated that the Green Book was made available at this meeting and disseminated without restriction to anyone who wished to receive a copy. After the demonstration, representatives from

the five companies answered questions from the press regarding the Green Book design.

The Green Book itself bears a date of May 21, 1991 and states that it may be freely copied by anyone. It is not designated on its face as confidential or proprietary information.

The five companies issued a joint press release on May 21, 1991 announcing the publication of the Green Book. The press release stated in part (emphasis added):

> Five leading network equipment and semiconductor manufacturers today announced that they have defined and **published an open, interoperable solution** for transmitting data at 100 Megabits per second (Mbps) using the Fiber Distributed Data Interface (FDDI) signaling over shielded twisted pair (STP) cable. After much work and investment in making the technology sound, Advanced Micro Devices, Chipcom Corp., Digital Equipment Corp., Motorola, Inc. and SynOptics Communications, Inc., demonstrated the interoperability of their products in an event held here today.
>
> . . . .
>
> **The specification for this implementation is available in the public domain to any party interested in providing FDDI on STP to their customers. The specification document is free of charge and is available now from the contacts listed at all five companies**. It outlines signal characteristics required to be interoperable, as well as example implementations utilizing existing integrated circuit technology. Additionally, the solution is achievable with currently available devices.

The press release provided the name, address, and phone number of a representative from each of the five companies from whom a free copy of the Green Book could be obtained. The press release was picked up and reproduced by Business Wire and is still available on Lexis-Nexis.

Joyce Radnor, who worked for DEC in 1991, was one of the contact persons

listed in the press release. She was responsible for announcing the release of the Green Book to the media and coordinated her efforts with public relations employees at the other four companies. Radnor said that the Green Book was freely available to anyone who requested a copy from DEC. She also said that she actually mailed the Green Book to some individuals, although she could not recall how many.

Another contact person, Rene Siegel, who handled public relations for SynOptics at the same time, said that the Green Book was freely available from SynOptics. She recalled preparing a press kit for distributing the Green Book to the media or any person who requested a copy. Specifically, Siegel sent a press kit to the editor of a trade journal called Communications Week after the May 21, 1991 meeting. Subsequently, an article appeared in the May 27, 1991 issue entitled "FDDI Spec Consortium," which stated in part (emphasis added):

> Digital Equipment Corp. and four other industry vendors last week announced that they have defined and **published** a specification for using shielded twisted-pair wire with networks based on the Fiber Distributed Data Interface.
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> . . .
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> . . . DEC's FDDI product marketing manager, Karl Pieper, said the specification–which will be made available to the American National Standards Institute at its next committee meeting–is only intended as "an interim interoperability solution until there is a true standard."

Additionally, two articles appeared in the May 27, 1991 issue of Network World,[25] which stated that the "joint specification will be available at no cost to any vendor and

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[25]Peter Tarrant, a SynOptics engineer, stated in his declaration that "Communications Week and Network World were popular journals in the network community, read by many engineers."

will be submitted to ANSI's X3T9.5 Twisted Pair-Physical Layer Medium Dependent committee for adoption as a standard." An article in the September 1991 edition of FDDI Interconnection News reported the May announcement and stated that "[t]he specification for this implementation is available to anyone interested in providing FDDI on STP to their customers." The article also listed a representative from each of the five companies to contact for a free copy.

Cisco also says that the Green Book was published on June 18, 1991 when the Green Book's proponents made a presentation at a public X3T9.5 TP-PMD Committee meeting in Minneapolis, Minnesota. Approximately ninety engineers were present. Numerous witnesses said that the Green Book was presented and explained at the meeting. Robert O'Hara, a manager at AMD, said that the five companies suggested to the X3T9.5 TP-PMD Committee that it adopt the FDDI-over-STP solution as defined in the Green Book. Dr. F. Williams Sarles, a regular attendee at X3T9.5 TP-PMD Committee meetings, said that according to the committee's regular practice, the Green Book "would have been made available either at the June 18, 1991 meeting or subsequently by mail to the working group participants in attendance or on the mailing list." Cisco has also produced a hard copy of a non-confidential Power Point presentation handed out at the meeting that shows the same "cable detect" circuit from the Green Book. Floyd Ross, the Vice Chairman of ANSI's main X3T9.5 committee, was in attendance and received a copy of the Green Book either just before or during the meeting. Dr. F. Williams Sarles received a copy of the Green Book prior to the June 18, 1991 meeting.

The voluminous evidence submitted by Cisco, which Chrimar does not dispute, conclusively demonstrates that the Green Book was publicly accessible. Chrimar's main argument in rebuttal is that the Green Book was only accessible to individuals from the five companies that drafted it, which Chrimar calls the "Authoring Group." Chrimar says that availability of a document to its own authors does not prove publication to the public at large.

However, Cisco only needs to show that the Green Book was reasonably available "to the public interested in the art." In re Hall, 781 F.2d at 899. Michael Howard said that invitations for the May 21, 1991 demonstration were sent to "FDDI manufacturers and trade press." The May 20, 1991 issue of Communications Week publicized the demonstration prior to the event. Robert O'Hara attended the demonstration and confirmed that it was "well-publicized." After the demonstration, interested persons would certainly be informed of the FDDI-over-STP achievement and the existence of the corresponding written standard by the multiple press releases, press kits, and articles in Communications Week, Network World, and FDDI Interconnection News. Indeed, this fact is confirmed by Floyd Ross and Dr. F. Williams Sarles, who each received a copy of the Green Book despite not being affiliated with any of the five companies in the "Authoring Group" or Cisco.

Once the existence and availability of the Green Book were known, interested individuals had easy access to it. Numerous witnesses have said that the five companies freely distributed the Green Book to anyone who requested a copy. The May 21, 1991 press release and September 1991 issue of FDDI Interconnection News each listed representatives from the five companies who could supply interested

persons with a copy of the Green Book. Joyce Radnor said that she actually mailed the Green Book to some individuals who requested it and Rene Siegel said that she prepared a press kit for distribution to interested persons.

Chrimar argues that the Green Book was "not housed in a library or other depository where persons would normally look for publicly available technical information." According to Chrimar, private sector companies like those in the "Authoring Group" typically keep technical information highly secret and therefore are not proper sources for such documents. However, a document is not inaccessible merely because it comes from a traditionally private source. See Constant, 848 F.2d at 1568-69 (finding "extensive uncontroverted evidence of business practice" sufficient to prove that Intel distributed a specification sheet to the public). If an interested individual of ordinary skill in the art could locate it after exercising reasonable diligence, the document is a "printed publication" in the patent law sense. MIT, 774 F.2d at 1109; Friction Division Prods., Inc. v. E.I. DuPont de Demours & Co., Inc., 658 F. Supp. 998, 1008 (D. Del. 1987) ("The publication requirement may . . . be satisfied by distributing or making the paper available at a conference where persons interested or skilled in the subject matter of the paper were told of the paper's existence and informed of its contents. Likewise, distribution to commercial companies without restrictions on use constitutes publication.") (citing MIT, 774 F.2d at 1109). Here, instead of being cataloged and housed in a university library, see In re Hall, 781 F.2d 899-900, the Green Book was held by five private companies (not just one) who sent out "library index cards" to interested persons in the form of press releases, press kits, and trade journal articles so that they could easily locate it. An interested individual certainly

could have obtained a copy of the Green Book with reasonable effort by either attending the May 21, 1991 demonstration in person or by simply contacting any one of the five companies and asking for it.

Indeed, the whole purpose of the five companies' collaborative effort on the Green Book, as well as the May 21, 1991 demonstration and June 18, 1991 presentation, was to create and agree on a common circuit design for FDDI-STP interoperability so that customers could use network equipment from multiple vendors interchangeably. Thus, the companies could better compete with rival technologies like Ethernet and sell more products. The natural motivation was to make the Green Book "open" solution **as public as possible**. See In re Wyer, 655 F.2d at 227 (stating that "intent to make public" is one factor among many in "determining whether an item may be termed a 'printed publication'"). Importantly, all of Cisco's third-party witness declarations are consistent with this underlying purpose while Chrimar has not presented any evidence showing that the "Authoring Group" did anything contrary to this purpose. The five companies clearly achieved their goal of making the Green Book reasonably available to all interested persons.

As a whole, the uncontroverted declarations submitted by Cisco amount to clear and convincing evidence that interested persons of ordinary skill in the art, not just the "Authoring Group," could locate the Green Book prior to November 1991 after exercising reasonable diligence. As a matter of law, the Green Book is a "printed publication" under 35 U.S.C. §§ 102(a) and 102(b).